Claims

1. A spatial positioning system, comprising:

a transmitter having:

a rotating laser head adapted to emit light in the shape of a divergent rotating fan onto a field of measurement,

a synchronization strobe adapted to provide a synchronization strobe beam in said field of measurement, said synchronization strobe including first strobes having first divergence characteristics, wherein said strobe beam has overall divergence characteristics different from said first divergence characteristics of said first strobes; and

a sensor adapted to sense when said transmitter is oriented to sweep said divergent rotating light fan about a desired axis and communicate such orientation for a spatial coordinate determination;

a receiver positionable in said field of measurement having a detector to detect said divergent rotating light fan and said synchronization strobe beam; and

a processor adapted to determine at least one spatial coordinate of said receiver based on the detection of said divergent rotating light fan and said synchronization strobe beam.

2. The spatial positioning system according to claim 1, wherein said processor is further configured to determine said at least one spatial coordinate upon receipt from said transmitter of an indication that said transmitter is oriented to sweep said divergent rotating light fan about said desired axis.

3. The spatial positioning system of claim 1, in which said transmitter changes the sweep frequency of said transmitter when said sensor senses that said transmitter is oriented to sweep said divergent rotating light fan is rotated about said desired axis.

4. The spatial positioning system according to claim 1, wherein said desired axis is substantially vertical.

5. The spatial positioning system according to claim 1, wherein said desired axis is substantially vertical.

6. The spatial positioning system according to claim 1, wherein said desired axis is adjustable between a vertical and a horizontal orientation.

7. The spatial positioning system according to claim 1, wherein said overall divergence characteristics includes both narrow and wide divergence characteristics.

8. The spatial positioning system according to claim 1, wherein said synchronization strobe further comprises second strobes having a second divergence characteristics, wherein said strobe beam has overall divergence characteristics different from said first divergence characteristics of said first strobes and said second divergence characteristics of said second strobes.

9. The spatial positioning system according to claim 8, wherein:

said first strobes comprise narrow divergence characteristics;

said second strobes comprise wide divergence characteristics; and said overall divergence characteristics comprises a mixture of narrow and wide divergence characteristics.

10. The spatial positioning system of claim 1, in which said receiver includes a photodetector that may be pivoted with respect to said receiver so as to facilitate operation.

11. A spatial positioning system, comprising:

a transmitter having:

a rotating laser head adapted to emit light in the shape of a divergent rotating fan onto a field of measurement,

a synchronization strobe adapted to provide a synchronization strobe beam in said field of measurement, said synchronization strobe beam having a first radiant intensity distribution; and

a sensor adapted to sense when said transmitter is oriented to sweep said divergent rotating light fan about a desired axis and communicate such orientation for a spatial coordinate determination;

a receiver positionable in said field of measurement having a detector to detect said divergent rotating light fan and said synchronization strobe beam; and

a processor adapted to determine at least one spatial coordinate of said detector in said receiver based on the detection of said divergent rotating light fan and said synchronization strobe beam.

12. The spatial positioning system according to claim 11, wherein said synchronization strobe further provides a strobe beam having a second radiant intensity distribution, wherein said strobe beam has an overall radiant intensity distribution different from said first and second radiant intensity distributions.

13. A spatial positioning system capable of operating in a horizontal or a vertical mode, comprising:

a transmitter adapted to produce and rotate an angled fan of light selectively about either a substantially horizontal or a substantially vertical axis, said transmitter including:

a transmitter processor;

a strobe emitter that emits a light pulse in predeterminerelation to the position of the angled fan of light; and

a sensor adapted to sense and communicate to said transmitter processor when said angled fan of light is sweeping about a substantially vertical axis;

a receiver, including a light detector adapted to be positioned in a field of operation and detect said strobe and said angled fan of light; and

a receiver processor in data communication with said receiver, said receiver processor operatively configured to determine an azimuth and an elevationof said receiver with respect to said transmitter based on timing of detections of said fan of light and from said light pulse from said strobe emitter; and further in which said transmitter processor signals said receiver processor that said angled fan of light is sweeping about a desired axis.

14. A transmitter and spatial positioning receiver for a spatial positioning system, said system capable of switching between a horizontal and a vertical mode, said system comprising:

a spatial positioning receiver for positioning within a field of measurement, including a detector for detecting light

a transmitter emitting a divergent rotating light fan onto said field of measurement and having a synchronization strobe providing a synchronization strobe beam onto said field of measurement, said transmitter pivotable between said horizontal and vertical modes and further including a first sensor to sense when said transmitter is oriented so as to sweep said divergent rotating light fan about a substantially vertical axis and a second sensor to sense when said transmitter is oriented so as to sweep said divergent rotating light fan in a substantially horizontal axis; and

a processor to determine at least one spatial coordinate of said detector based on a time of receipt of at least one of said divergent rotating light fan and said synchronization strobe beam.

15. A laser transmitter, comprising:

a rotating laser head adapted to emit light in the shape of a divergent rotating fan onto a field of measurement,

a synchronization strobe adapted to provide a synchronization strobe beam in said field of measurement, said synchronization strobe including first strobes having a first divergence characteristic, wherein said strobe beam has

overall divergence characteristics different from said first divergence characteristics from said first strobes; and

a sensor adapted to sense when said transmitter is oriented to sweep said divergent rotating light fan about a desired axis and communicate such orientation for a spatial coordinate determination.

16. A laser transmitter capable of switching between a horizontal and a vertical mode, said system comprising:

a divergent rotating light fan directed onto a field of measurement;

a synchronization strobe providing a synchronization strobe beam onto said field of measurement;

a first sensor to sense when said transmitter is oriented so as to sweep said divergent rotating light fan about a substantially vertical axis; and

a second sensor to sense when said transmitter is oriented so as to sweep said divergent rotating light fan in a substantially horizontal axis.

17. A spatial positioning system comprising:

at least two transmitters, each transmitter having:

a rotating laser head adapted to emit light in the shape of a divergent rotating fan defining a detection volume;

a synchronization strobe adapted to provide a synchronization strobe beam, said synchronization strobe including first strobes having a first divergence characteristic, wherein said strobe beam has overall divergence characteristics different from said first divergence characteristics of said first strobes; and

a sensor adapted to sense when said transmitter is oriented to sweep said divergent rotating light fan about a desired axis and communicate such orientation for a spatial coordinate determination;

wherein each of said at least two transmitters are positioned so that said detection volume of each transmitter at least partially overlaps defining a field of measurement;

a receiver positionable in said field of measurement having a detector to detect said divergent rotating light fan and said synchronization strobe beam from each transmitter; and

a processor adapted to determine at least one spatial coordinate of said detector in said receiver based on the detection of said divergent rotating light fan and said synchronization strobe beam from at least one transmitter.

18. The spatial positioning system according to claim 17, wherein said processor determines at least one of azimuth and elevation from a select one of said at least two transmitters.

19. The spatial positioning system according to claim 17, wherein more than two position variables are determined based upon the detection of said divergent rotating light fan and said synchronization strobe beam from at least two transmitters.

20. The spatial positioning system according to claim 17, wherein two spatial coordinates are determined from each transmitter.

21. The spatial positioning system according to claim 20, wherein said two spatial coordinates comprise azimuth and elevation.

22. A spatial positioning system comprising:

at least two transmitters, each transmitter configured to scan light across a field extending horizontally and vertically, defining a detection volume over which said divergent rotating fan can be detected by a receiver, wherein said transmitters are positionable such that at least a portion of said detection volume of each transmitter overlaps defining a field of measurement wherein at least one position variable may be determined by said receiver; each transmitter further comprising:

a synchronization strobe adapted to provide a synchronization strobe beam in said field of measurement, said synchronization strobe including first strobes having a first divergence characteristics, wherein said strobe beam has overall divergence characteristics different from said first divergence characteristics of said first strobes.

23. The spatial positioning system according to claim 22, wherein said receiver is programmed to compute up to three position variables within said field of measurement.

24. A spatial positioning system comprising:

at least two transmitters, each transmitter configured to scan light across a field extending horizontally and vertically, defining a detection volume over which said divergent rotating fan can be detected by a receiver, wherein said transmitters are positionable such that at least a portion of said detection volume of each transmitter overlaps defining a field of measurement wherein at least one position variable may be determined by said receiver; each transmitter further comprising:

a synchronization strobe adapted to provide a synchronization strobe beam in said field of measurement, said synchronization strobe including first strobes having a

first radiant intensity distribution, wherein said strobe beam has an overall radiant intensity distribution different from said first radiant energy distribution.

25. The spatial positioning system according to claim 2, wherein said receiver is programmed to compute up to three position variables within said field of measurement.